REMARKS

This communication is in response to the Office Action dated June 25, 2005. Claims 1-29 are pending in the present Application. Claims 1-6, 8-12, 14-19, 21-24 and 26-28 are rejected. Claims 7, 13, 20, 25 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

102 Rejections

Claims 1, 8, 14, 21 and 26

For ease of review, Applicant reproduces independent claims 1, 8, 14 and 21 herein below:

1. A method for dynamically controlling cooling resources in a data center comprising:

determining a workload within the data center;

determining an amount of heat being generated as a function of the workload; and

activating each of a plurality of different types of cooling resources within the data center in an optimal fashion based on the heat being generated.

8. A system for dynamically controlling cooling resources in a data center comprising:

means for determining a workload within the data center;

means for determining an amount of heat being generated as a function of the workload; and

means for activating each of a plurality of different types of cooling resources coupled within the data center in an optimal fashion based on the amount of heat being generated.

14. A data center comprising:

a global computer system;

a plurality of different cooling resources coupled to the global computer system; and

a cooling resource control module coupled to the global computer system and the plurality of different cooling resources wherein the cooling resource control module includes logic for:

determining a workload within the global computer system;

determining an amount of heat being generated as a function of the workload; and

activating each of a plurality of different types of cooling resources coupled to the global computer system in an optimal fashion based on the amount of heat being generated.

21. A computer program product for dynamically controlling cooling resources in a global computer system, the computer program product comprising a computer usable medium having computer readable program means for causing a computer to perform the steps of:

determining a workload within the global computer system;

determining an amount of heat being generated as a function of the workload; and

activating each of a plurality of different types of cooling resources coupled to the global computer system in an optimal fashion based on the amount of heat being generated.

26. A cooling resource control module for a data center comprising:

determination logic for:

determining a workload within the data center; and

determining an amount of heat being generated as a function of the workload; and

activation logic for activating each of a plurality of different types of cooling resources within the data center in an optimal fashion based on the amount of heat being generated.

The Examiner states:

> **Claims 1-6, 8-12, 14-19, 21-24 and 26-28 are rejected under 35 USC §102(e) as being anticipated by Friedrich et al. (US 2003/0193777).**

Applicant respectfully disagrees. The present invention includes a method and system for dynamically controlling cooling resources in a data center. The present invention dynamically controls a plurality of different types of cooling

resources within a data center based on the workload constraints (power consumed, latency, etc.) of the data center. Accordingly, each of the plurality of different types of cooling resources is activated in an optimal fashion based on the workload constraints. As a result of the use of the method and system in accordance with embodiments of the present invention, a substantial savings in operational costs related to cooling resources is achieved.

Claim 1 recites a method for dynamically controlling cooling resources in a data center that includes determining a workload within the data center, determining an amount of heat being generated as a function of the workload and ***activating each of a plurality of different types of cooling resources*** within the data center in an optimal fashion based on the heat being generated. (Emphasis added.)

The Examiner states that the Friedrich reference anticipates the present invention. Applicant respectfully disagrees and asserts that the Friedrich reference does not disclose ***activating each of a plurality of different types of cooling resources within the data center in an optimal fashion*** based on the heat being generated as recited in claim 1 of the present invention. Friedrich discloses an energy management system for one or more computer data centers, including a plurality of racks containing electronic packages. The electronic packages may be one or a combination of components such as, processors, micro-controllers, high-speed video cards, memories, semi-conductor devices, computers and the like. The energy management system includes a system controller for distributing

workload among the electronic packages. The system controller is also configured to manipulate cooling systems within the one or more data centers.

In response to the Applicant's argument filed on June 16, 2005, Examiner states that the Applicant's arguments with respect to claims 1-4, 6, 8-10, 21-24 and 26-28 have been considered but are moot in view of the new ground(s) of rejection. Applicant argued that paragraph 33 did not teach activating a plurality of different types of cooling resources. Although paragraph 33 discusses different cooling arrangements, paragraph 21 more clearly points out these arrangements by discussing cooling vents, a fan, a cooling coil, and "other conditioning elements."

Applicant asserts that the Friedrich reference only relates to the activation of a single cooling resource (fluid-based air-conditioning resource). ***Friedrich does not teach or suggest the step of activating each of a plurality of different types of cooling resources within the data center in an optimal fashion based on the heat being generated.*** Paragraph 21 of Friedrich reads:

> As outlined above, the system controller 130, illustrated in FIG. 1A, controls the operation of the cooling system 115 and the distribution of work among the plurality of computer racks 110. The system controller 130 may include a memory (not shown) configured to provide storage of a computer software that provides the functionality for distributing the work load among the computer racks 110 and also for controlling the operation of the cooling arrangement 115, including the cooling vents 120, the fan 121, the cooling coil 122, the compressor 123, the condenser 124, and various other air-conditioning elements. The memory (not shown) may be implemented as volatile memory, non-volatile memory, or any combination thereof, such as dynamic random access memory (DRAM), EPROM, flash memory, and the like. It should be noted that a data room arrangement is further described in co-pending application: "Data Center Cooling System", Ser. No. 09/139,843, assigned to the same assignee as the present application, the disclosure of which is hereby incorporated by reference in its entirety.

Although Freidrich discloses a variety of different cooling elements, these

elements make up a single fluid-based cooling resource. This is evidenced in paragraph 26 of Freidrich which reads:

> ...the optimizing calculations may be based on a constant workload distribution and a variable cooling arrangement. For example, the calculations may involve permutations of possible workload-to-cooling arrangements that have a fixed workload distribution among the electronic packages 112a-112p, but a variable cooling arrangement. Varying the cooling arrangement may involve varying the distribution of cooling fluids among the vents 120a-120p, varying the rate at which the cooling fluids are distributed, and varying the temperature of the cooling fluids.

As can be seen Friedrich varies the cooling arrangement by varying the rate at which the cooling fluids are distributed and varying the temperature of the cooling fluids. Applicant again asserts that Freidrich does not teach the step of activating each of a plurality of different types of cooling resources within the data center in an optimal fashion based on the heat being generated as recited in the present invention. The cooling system of the present invention includes a plurality of different types of cooling resources. For example, in an embodiment of the present invention, a first type of cooling resource is an air-based cooling resource, a second type of cooling resource is a liquid-based cooling resource and a third type of cooling resource is a gas-based cooling resource. ***The Friedrich reference does not disclose the implementation of a plurality of different cooling resources as recited in the independent claims of the present invention. Freidrich only discloses the implementation of a single, liquid based cooling resource.***

Furthermore, as stated in the previous response, claim 2 recites an embodiment whereby the optimal fashion is based on a cost associated with the

activation of each of the plurality of different cooling resources. ***Friedrich does not teach or suggest an optimal fashion based on a cost associated with the activation of each of the plurality of different cooling resources.*** The Examiner stipulates that Friedrich teaches this step in paragraph 33. Paragraph 33 reads:

> After determining the energy utilization of the servers 112a, 112e, 112h and 112m, the system controller 130 may determine an optimal workload-to-cooling arrangement. The optimal workload-to-cooling arrangement may be one in which energy utilization is minimized, or one in which energy cost are minimized. In this example, the energy utilization is to be minimized, therefore the system controller 130 performs calculations to determine the most energy efficient workload-to-cooling arrangement

Although Friedrich discloses cooling optimization to minimize energy utilization or to minimize energy costs, Applicant fails to see how this paragraph demonstrates that an optimal fashion of activating each of a plurality of different cooling resources is based on a cost associated with the activation of each of the plurality of different cooling resources.

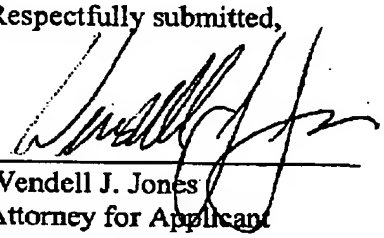
Consequently, since the Friedrich reference merely discloses varying the rate at which the cooling fluids are distributed and varying the temperature of the cooling fluids of a single fluid-based cooling resource, Friedrich does not disclose the step of activating each of a plurality of different types of cooling resources within the data center in an optimal fashion based on the heat being generated as recited in the independent claims of the present invention. Accordingly, independent claims 1, 8, 14, 21 and 26 of the present invention are allowable over the Friedrich reference.

Claims 2-6, 9-12, 15-19, 22-24 and 27-28

Since claims 2-6, 9-12, 15-19, 22-24 and 27-28 are respectively dependent on claims 1, 8, 14, 21 and 26, the above-articulated arguments with regard to independent claims 1, 8, 14, 21 and 26 apply with equal force to claims 2-4, 6, 9-10, 22-24 and 27-28. Accordingly, claims 2-4, 6, 9-10, 22-24 and 27-28 should be allowed over the Examiner's cited reference.

Applicant believes that this application is in condition for allowance. Accordingly, Applicant respectfully requests reconsideration, allowance and passage to issue of the claims as now presented. Should any unresolved issues remain, Examiner is invited to call Applicant's attorney at the telephone number indicated below.

Respectfully submitted,



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